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ABSTRACT

Some concerns regarding the use of computers in reading instruction are addressed in this report. The first section explores the similarities and differences between reading printed materials and computer display screens (legibility, portability, etc.) and presents some advantages and disadvantages of computers. The next section explains two ways in which computer programs for education can be categorized: according to the written structure of the program (drill, tutorial, simulation, etc.) and according to student needs (to inform, reinforce, etc.). Next, a software evaluation checklist, provided for teachers, focuses on aspects of programs that facilitate the ease and efficiency of reading, including screen appearance, line breaks, and accompanying documentation. The paper then describes two programs promoting the combined teaching of reading and writing--the Bank Street Writer and the Story Tree from Scholastic--and suggests 24 activities for use with these programs, including correcting misspellings, incorrect grammar, and punctuation; putting sentences in proper sequence; creative writing; and editing. The last section discusses the need for including computer-related books in the classroom library and provides short abstracts of books representing the three main categories of books on computers (computer literacy, programming, and fiction). (LLZ)

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READING AND COMPUTERS--HOW TEACHERS CAN MAKE THEM WORK TOGETHER

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Relationships Between Reading Printed Materials and Computer Display Screens

Reading is an established and valuable tool ability that is a fundamental part of the school curriculum. With the introduction of the computer into the learning environment, there is a new set of abilities for which a place in the curriculum must be found. These areas of reading and computers are mutually supporting and mutually demanding. The computer presents material using formerly uncommon symbols, wordings, and video screen displays with which students must be taught to deal. In addition, there are volumes of traditional text which must be efficiently read if computers are to be used effectively. All of this places new demands on the reading curriculum. In exchange, computers are capable of facilitating writing, permitting selection of pertinent reading materials, and assisting in the delivery of reading instruction. The integrating of the teaching of these two areas is the new challenge for reading teachers and school systems.

At present, reading is usually taught through the use of textbooks and/or trade books, and the computer is primarily used to present reinforcement of isolated reading skills that have previously been taught by the teacher. In some classrooms, teachers provide opportunities for children to use word processing programs to practice language skills and to develop

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writing abilities by improving basic sentence structure, using alternative ways of expressing thoughts, experimenting with paragraph arrangement, and developing a cohesive overall organization of a theme. Students who use word processors are freed from the mechanics of writing (such as handwriting and spelling) in order to concentrate on the "idea development" of composition. The process of proofreading and editing one's writing can be simplified by the computer. Some students are using the word processor on a regular basis to write reports, creative compositions, newsletters, or daily logs, although at this time these activities are usually supplementary to the basic core reading program.

There has been extensive research about the reading process, the skills involved in successful reading, effective methods for teaching, and development of instructional and recreational reading materials, as well as many other areas. These should be considered as computers and software are developed so effective learning may occur. Basic to effective reading is the legibility and readability of print. Legibility, as defined by Tinker, "deals with coordination of those typographical factors inherent in letters and other symbols, words, and connected textual materials which affect the ease and speed of reading."(Tinker, 1964) Through numerous studies, he found that legibility of individual letters is influenced by some single distinguishing part of a letter, the white space area within the outline of the letter, and size. His studies also explored the effect of spacing of print on a page, space between lines, type of print, capital versus mixed print, size of print, line length, background color, slant of reading surface, distance from reader to text, and many other aspects of print. (Tinker, 1964)

It appears that, although these studies have influenced the production of books and other printed materials for many years, few, if any, computer software designers are making application of these findings. Computer

programs also require the reading of print, although the display medium differs. With children as well as adults spending more and more time reading from a computer visual display screen, these factors of legibility should again be examined in view of this varied application. Software designers should attempt to facilitate "ease and speed of reading" through careful provision for these factors. Teachers must encourage optimum legibility and readability by considering these factors in the purchase of programs. They should also formally review software with these factors in mind and insist that publishers comply.

Reading Computer Screens vs. Printed Materials

Current software applications violate principles used for development of books in a wide variety of ways. Reading a computer screen can be quite different from reading books. Although one is still looking at words and decoding them, and comprehending a message, the way the information is presented is different.

Physical differences can be seen in the way material is read. The screen is at a vertical or slightly tilted position, and it is sometimes placed at eye level or higher, whereas a book is usually held at a slight slant just a bit above horizontal position and is below eye level. The latter puts less strain on the neck and is less tiring over prolonged periods of reading. With a computer, there is constant refocusing of the eyes to move back and forth between the screen and the keyboard, which also adds strain to the eyes. Many times screens of print scroll up one line at a time, requiring reading continuously at the bottom of a page, instead of moving to the top of a completely new screen (page). The distance between the reader and the text is usually closer than for book reading. Looking at a lighted area which often creates a glare can tire the eyes. Letters often pulsate (vary in

brightness and sharpness) on the screen, requiring minute adjustments of the eye as reading is done. The letter image may not be very clear or sharp. Print and background color are often reversed from books, with the print being white or gray on a darker tone background.

Some specific differences in legibility and screen format may be noted. The text may be written in all capitals rather than the usual mixed print found in books. Letters may be crowded in order to get as much on a screen as possible. Letter shapes may be irregular. Both typed and graphic print are used. There may also be a lack of clear background to set off the print, and line length is often inconsistent. In some programs, line breaks may occur at nonsyllabic points within words. Inverse printing may be used to emphasize certain words, and needs to be associated with the use of bold type or italics in printed materials. Print appearance occurs one letter at a time, sometimes slowly. The movement may be distracting as one attempts to read. Special symbols and/or directions for operating the program must be learned and concentrated on while also trying to read and remember the content. These operational steps break the reader's train of thought, whereas while reading a book one need only to turn the page.

Computer programs also differ from books in the style of writing used and the content. Vocabulary may not be as controlled as it is in reading texts, exposing children to a great number of words they must identify. Readability level is often not designated. In addition, computer related terms such as return, space bar, ESC, and arrow must be learned along with the usual reading vocabulary. Text may be presented in short terse statements rather than in fully developed paragraphs. Many lists or phrases are used, and punctuation may be omitted. Much of the text may be directions to be

followed rather than expository matter providing information. Little use is made of fictional writing, involving plot and conversation. Too many times only low level thinking skills are required.

At the present time, reading skills of the more abstract nature are not sufficiently dealt with by existing computer software. For instance, skills such as the following are not commonly handled through computer instruction: development of the internal structure of paragraphs, relationships of ideas, characteristics of styles of writing (narrative, expository, persuasion, etc.), literary techniques (irony, humor, flashback, parody, etc.), comparing ideas from several sources, making critical judgments, propaganda analysis, outlining, predicting outcomes and drawing conclusions, identifying characterizations, and taking notes. Those skills most often found are ones requiring convergent thinking, tasks whose answers can be judged right or wrong so reinforcement can be given, such as letter naming, sight word recognition, phonics and structural analysis, alphabetizing, literal comprehension, spelling, or parts of speech.

The way study skills are used also differs when reading computer programs. Scanning and skimming are not used as easily. There is no way to preview a selection by flipping through it, looking at headings, pictures, tables, and so on before actually reading the material. Previewing allows a reader to check out material to see if it is relevant to his/her purposes before using time reading it. It also allows the reader to form a gestalt of what the selection is about to assist comprehension and organization of the content as it is read. Neither of these is possible when using most computer programs. Likewise, for most programs, a review of a selection by glancing through the whole text or by restudying a certain part which was not well understood at the first reading is not possible, but rather the whole program must be worked from start to finish. When reading a book, if we have to stop

reading for some reason, we place a bookmark there, and can continue from that point next time we read. With a computer program, this is usually impossible and we must start over and go through what has already been done until we reach the point where we exited.

An overview of software reveals that most programs are a variation of testing and do not serve to teach skills. Since the majority of the programs used by teachers are drill and practice, and since these are based on the assumption that necessary instruction on the skill has been given before students use the computer, it would seem that the programs are used as a check to see if the knowledge/skill has been learned. There are tutorial programs which do present information as the tasks proceed, but these are less frequently found.

And lastly, unless one has a small portable computer, one cannot curl up under a tree with a good computer program. The personal relationship we can develop with a book is seldom found while working at a computer. Books have a flexibility in use, format, content, and application which is simply not found with computers. Books are usually more accessible, and can go with us wherever we go.

Uses of Computers for Teaching Reading

Are computers a good way to teach reading to children? There are certain pros and cons to this issue. Let us look first at the values. For drill and practice on specific skills, computers seem especially effective. Instruction given to small groups of children by the teacher can be followed up by independent practice at the computer for reinforcement. This frees up teacher time for working with children in other ways. Such programs usually give a series of tasks sequenced from easy to more difficult, provide immediate feedback as to the correctness of the responses, and in some cases,

explain why a response is unacceptable. The program may even branch to provide further instruction based on a child's pattern of errors. A child not making such errors would not see this material. The animation and sound possibilities of the computer add interest for children beyond what can be done with printed materials. Concepts can be actually demonstrated while the reader is reading about them. There is frequent active response interspersed throughout the reading. This helps the reader to maintain attention and to remember. Scoring and record keeping of performance, through management systems, save time for the teacher and facilitate monitoring of student progress.

More sophisticated computer programs can provide on-line reading aids to assist the reader. Definitions of words may flash on the screen if the reader touches the screen or keys in a certain code. Voice synthesizers may pronounce unknown words for the reader. Although non-existent at present, it is possible that the computer could serve as an electronic encyclopedia. If a reader wanted more information about a concept or topic being read about, he/she could call up such information on the screen at that time. Information from various sources could be displayed on the screen concurrently to allow a comparison of ideas. A given command could transfer the screen or selected portions of it to a "notepad" for later use, or permit notetaking, outlining, or summarizing of the ideas using a word processor.

With the current emphasis on the integration of writing and reading, the computer is an invaluable tool. The task of writing, reading, and rewriting is greatly simplified when a computer is used. Children can identify with authorship through their experiences on the computer, thus better understanding materials by other authors which they read.

The content of some programs can be easily changed by the teacher who can insert the particular content the class has been studying. It is not possible to so alter books, but rather the content as written by someone else must be used.

Limitations

On the other side of the issue, there are definite limitations to using a computer to teach reading. Some of these have been noted above, in terms of the mechanics of reading, the type and style of content to be read, and the structured ways in which reading is done on a computer. Reading via the computer may have its particular uses, but is not like reading from books.

Although there are parts of reading instruction which can be done using a computer, they are often rather supplementary to "real reading." At least in today's world most reading is done using printed materials. The ultimate goal of reading instruction is to develop people who recognize the values and pleasures of reading and will read voluntarily for enjoyment or for information. This type of reading will more than likely be done using books and other printed materials, not sitting in front of a computer for hours. We learn to do a skill by using it, not by studying about it. Therefore we learn to read by reading, in the most "real" situations as possible. Computers may help us learn to read, but the final application will probably be in a non-computerized setting.

Adapted Instruction

There is little question that books will always be around and that people will read them. Therefore the skills needed for reading printed materials should continue to be taught. But since reading computers is also an important ability in today's world, and since such reading differs from

book reading, it is necessary to teach children how to read computer programs. The ability to read printed materials does not automatically transfer to the type of reading needed to use computers.

Because so much of the reading of computer programs consists of following directions, children should be given intensive instruction in how to read and follow directions, including (1) noting key words and what each means, (2) recognizing the sequence of steps and relationship of ideas, (3) reading all directions before starting, and (4) rereading all directions afterwards to insure that nothing was omitted. These last two are sometimes not possible in computer programs because steps are given separately rather than as a complete list.

Getting information from short, sometimes incomplete, sentences must be taught. Children need to recognize significant words and phrases without much explanation or descriptive language. A much heavier emphasis is placed on informational reading rather than narrative, which is predominant in basal readers. Teachers need to help students deal with the structure of such writing and how a topic may be developed. Children should be taught to take personal notes on things they want to remember due to the difficulty of going back through the text on a computer.

Word identification without configuration clues must be taught so children can read text written in all-capitals. This requires study of each letter until enough of a word is processed to know the word, whereas with mixed print, words can be recognized more readily as whole units. The use of context clues is the most effective technique of word identification when reading books. Yet this is limited in computer reading due to the brevity of the written text. Specific teaching of the vocabulary commonly found in

computer programs must be done, both to help children identify the unlimited variety of words used, and to deal with the technical vocabulary of computer operation, such as Return, ESC, space bar, menu, etc.

Since many styles of writing and many higher level reading skills are not usually found in computer programs, teachers must provide such experiences for children through book reading. There will always be a need for reading of narrative materials, including children's literature, whereas perhaps it will be found that computers are better used to provide short-term exercises related to reading done in books. Word processing programs which combine writing and reading are, of course, recommended as an effective use of computers.

As the design of computer programs and hardware continues to change, it is hoped that some of the differences between reading printed materials and computer screen displays will be noted, and improvements made. If teachers are wise consumers, and purchase only those programs which present reading in the best of ways, based on research findings, software producers will be forced to provide such quality materials. Until this time arrives, teachers need to be aware of the reading differences discussed, and help children make needed adjustments for the different types of reading they are required to do.

Printed materials and computers are interrelated. Both have a role to play in the lives of children (and others) in today's world and in the future. If teachers are to make appropriate use of both, they need to know what each has to offer for learning to read. The two are complementary if their relationships and their strengths and weaknesses are recognized.

Programs Come in Many Forms

Instructional software is developed for a variety of purposes. Teachers need to be able to determine what each program is intended to accomplish in order to select programs appropriate for their instructional needs. Some of the major types of programs are described in the following sections. Although these descriptions will help teachers analyze programs, the best way to learn if a program meets instructional needs is to try the program with several students. Also, in reality, programs may fit into more than one category.

Categories According to Written Structure of the Program

The most common form of program available to teachers is **drill and practice.** Such programs assume students already have some knowledge about the content used in the program, and present a series of questions or tasks to which students respond. Immediate reinforcement is given for responses, informing students whether their answers are correct or not. Some programs allow more than one try before correctness is recorded. Usually no explanation is given about why an answer is unacceptable. The tasks require students to use convergent thinking, since responses must be judged for accuracy. Various formats are available. Common ones are multiple choice, matching, or fill in the blank.

Letter recognition, sight words, phonics and structural analysis, alphabetizing, grammar, and literal comprehension are some of the reading skills that lend themselves best to drill and practice programs because of the predictability of the responses. It is evident that higher-level thinking is not necessary for execution of most drill and practice programs.

Another type of instructional software is **tutorial.** These programs provide some instruction for the student about the skill or concept required to complete the program. The instruction may be presented before the items

requiring student response or may be interspersed throughout the program. After students respond, they receive feedback as to the correctness of the response as well as an explanation of why an incorrect answer was wrong and what it should have been. This extends learning more than simply a brief indication of whether an answer is right or wrong, as in a drill and practice program.

Tutorial programs are helpful to supplement instruction given by teachers, but should not be expected to provide the only instruction students receive on that concept. Tutorial programs may also be used to help absentees catch up with the class or to provide reteaching if needed.

Simulation programs are operational models of some aspect of reality. They enable students to participate in an experience which they would not be able to experience in reality. This might be due to physical limitations, financial limitations, time restraints, safety, different historical periods, or other conditions which make a real situation impossible. Students are presented with a situation, often involving a problem. Several options may be presented, from which students make a decision. The situation is adjusted accordingly, followed by further decision-making steps. There may also be a chance factor involved. The program can be used repeatedly, with different outcomes possible each time, depending on the decisions made.

Although at the present time simulation programs are more frequently found in social studies or science than in reading, there are a few programs applicable to reading instruction which might be considered to be simulations. Potential uses that could be developed for elementary children include story construction, sentence construction, and paragraph relationships.

Educational games appear as fun to the students, but often these games involve skills. The students do not realize they are learning, but receive practice as they play. Since there are instructional games and recreational

games, care must be taken to insure that the game selected supports the planned instruction. Some games require problem solving, strategic thinking, forecasting, noting relationships and patterns, as well as application of academic skills such as word recognition, spelling, or mathematics.

Word processing programs involve users typing in a selection of text and being able to alter that text, i.e., correct spelling, add letters or words, move sentences or paragraphs, delete text, combine parts, etc. This avoids rewriting by hand when several drafts of a piece of writing need to be done. Editing programs help writers identify weaknesses in spelling, grammar, usage, and other writing mechanics.

Some **testing** programs may enable teachers to develop tests to be used later by students. These programs give the teacher a method by which questions may be entered and saved. These are then presented to the students in printed form or on the computer, possibly in a random order.

Other testing or practice programs are commercially prepared, presenting questions or exercises about general material that most students should know, such as spelling words, math problems, etc. The results of the students' performance may be saved in the memory of such record keeping programs until later when teachers can look at them and record them for grading or planning purposes.

Management systems are programs that test students on a given body of information and record results for teachers' use. A manual often accompanies such programs to assist teachers in deciding what instruction students need next, based on their performance. Cumulative records for given students are often available, showing progress over a period of time. Printouts of scores and of letters to parents, showing strengths and weaknesses, may be available; these are very helpful in communicating student progress to parents.

Authoring systems are programs that a person not knowledgeable in programming can use to write a lesson. They often enable teachers to write drill and practice exercises or tests for their classrooms using the particular content the students have learned. The program consists of a series of questions to answer and decisions to make, as well as directions for entering content. The result is a program which can be used by students but is more directly tailored to their knowledge and skills than a commercially prepared program might be.

Readability programs apply readability formulas to samples of text typed in by teachers; these formulas indicate the reading difficulty level of the text. This helps teachers to match reading sources to particular students' reading abilities.

Categories According to Program Use Based on Student Needs

Thomas and Boysen have developed a taxonomy categorizing programs from a different perspective. The following descriptions view program use from the learner's developmental level. A given program from one of the previously described program types may fit into one or more of these levels, depending on the student's use and the teacher's purpose.

> Since student learning is the ultimate purpose in utilizing computers for instruction, a taxonomy should focus on the needs of the learner. It should provide some guidance for the development of lessons and their instructional use. It should also facilitate the design and communication of research studies.
>
> The categories proposed herein are experiencing, informing, reinforcing, integrating, and utilizing. The classifying variable is the state of the student with respect to the knowledge, skill or

attitude being acquired. Each category represents a step in the learning process with experiencing being the first step and utilizing being the last.

1. **Experiencing:** Experiential programs are used to set the cognitive or affective stage for future learning. They usually encompass a model of a concept, subject area or attitude which the student can manipulate in order to gain an intuitive understanding of the learning goal....

The success of experiential programs depends upon two very important conditions: 1) students relate to the programs, and 2) the programs relate to important intellectual structures or attitudes. Experiential programs are very rarely "stand alone" learning experiences. They are designed to make the teacher's job easier and the student's understanding much deeper. They precede formal instruction and should be used as a foundation for it.

2. **Informing:** Informing programs are used by students to acquire information. These programs supplement or replace the textbook and lecture as a means of initial formal exposure to a topic. Through careful design, the programs can map the student's existing knowledge and fill the gaps therein. The most common type of informing program is programmed instruction, in which paragraphs of information are presented, followed by questions to test the student's understanding....

3. **Reinforcing:** Students use reinforcing programs to strengthen specific learning objectives. The most obvious format for a reinforcing program is drill and practice, in which a sequence of stored or generated exercises are [sic] presented for the student to complete. It can be designed to adjust to the knowledge level of the

student and to track the student's progress. This type of application is easy to produce, requiring a relatively low level of programming skill, and is easy to use, requiring only a shallow philosophy of instruction....

4. **Integrating:** Integrating programs provide an opportunity for the student to apply previous learning to new situations as well as associate previously unconnected ideas. Computer simulations presenting a problem to be solved are commonly used for integrating. As the student understands and integrates the underlying concepts of the simulation, he becomes more adept at manipulating the model. This manipulation encourages process development and adds utility to the knowledge....

5. **Utilizing:** Once a student has learned a process, that process may be incorporated into a computer program and used as a tool. Many statistical, mathematical, business, scientific, and engineering procedures have been programmed for use by students and other consumers in these areas. The utilizing category is intended to include both textual and numerical manipulations.

For classroom use, these programs permit students to tackle more complex and realistic assignments. They permit classroom focus on problems involving the subject being taught by minimizing the need to focus on computations. Proper use of these tools contributes significantly to computer literacy....

It should ... be recognized that informing and reinforcing applications are usually computer-directed, whereas, experiencing, integrating and utilizing are learner-directed. It is through the use of the learner-directed applications that the student can and must develop the practice of asking, "what if?". It is through the

learner-directed applications that the highest levels of learning are achieved as well as the highest level of computer literacy. These applications also require the greatest degree of teacher competence and deepest philosophy of education (Thomas and Boysen, 1984).

Any one program can be used in various ways by teachers in a classroom. A program might be used in an exploratory way by one child, to provide him/her a first experience with a concept. The same program might be presented along with more structured guidance from the teacher to look for or do certain things with the program, thus becoming an informing program. If used following instruction by the teacher, that program may supply additional reinforcement on the concepts or skills taught. A broader-based application of knowledge in a less structured way can occur when using an integrating program, requiring the learner to relate bits of information previously learned separately. Proficient users may use the computer as a tool, utilizing knowledge in a variety of situations. No one program would be used in all of these ways by the same student, but might be used for one or more of the purposes depending upon the teacher's goals and the students' level of development in terms of the conceptual content. This method of viewing software--its potential according to the learner's development and needs--is more valuable to a classroom teacher than simply labeling a program as a drill and practice, tutorial, or whatever, for such labels give little help in knowing the best use for the program for specific students.

Teachers must carefully select the types of software programs that most effectively fulfill the needs of students and the goals of their curriculum. Students need to become familiar with a variety of uses of the computer. Therefore, they should be exposed to all types appropriate to the purposes of the classroom.

A Software Evaluation Checklist

The development of computer software is rapidly expanding in the world today. Companies are continually publishing new catalogs to keep up with the new programs marketed. Therefore, classroom teachers must ask, "What do I buy? Which ones are best? How can I tell?" These are important questions. Because of the great number of available programs, it is expected that some will be better than others. Educators must be informed consumers and be very selective in purchasing programs.

To make evaluation and selection easier, a checklist has been developed that focuses on aspects of programs which facilitate ease and efficiency of reading. Permission is granted to copy this checklist, for it is hoped that educators will find it useful for program evaluation.

Selected points in the checklist are explained below and additional information is given about why those points are important. Read this information while referring to the checklist. The points discussed in the following paragraphs are not the only ones to be considered. The others are as important but are self-explanatory. The number-letter code in parentheses after the item label refers to the corresponding item on the checklist which has an asterisk.

SOFTWARE EVALUATION CHECKLIST

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Directions: Place an X in the blank for each characteristic found for the software reviewed. If an item is not applicable to the program, write NA. Add your own comments throughout to supplement the Xs and to provide information that will help explain the program.

Program name:

Source/Pub. Co.: **Cost:**

Computer brand appropriate for:

Subject area(s):

Description of task involved:

Purpose/objective(s):

Readiness skills assumed:

Instructional grade level range:

1. **Documentation:**

a. Is there a teacher's manual? ____

b. Are directions for running program clear, complete? ____

c. Are program objectives specified? ____

d. Is lesson content shown in detail (reading selections, vocabulary lists, etc.)? ____

e. Are sample frames from the program shown? ____

f. Are trouble-shooting helps given? ____

*g. Has the program been field-tested? ____

h. Is there a separate manual for students to use? ____

2. **Program type:**

a. Drill and practice	____	b. Word processing	____
c. Tutorial	____	d. Simulation	____
e. Educ'l game	____	f. Editing	____
g. Testing	____		

3. **Appropriate Use(s):**

a. Experiencing ____ b. Informing ____
c. Reinforcing ____ d. Integrating ____
e. Utilizing ____

4. **Grouping:**

a. Is the program best used individually? ____

b. Could the program be used with a small group? ____

5. **Average time for use:**

a. Is time appropriate for grade level? ____

b. Is it appropriate for importance of concept? ____

c. Would the time fit your classroom schedule? ____

6. **Mechanics:**

*a. Is required typing kept to a minimum? ____

*b. Can response be made by typing only the first letter of a word? (y for yes; n for no) ____

c. Are types of responses varied? ____

*d. Is correct spelling required? If response is right but spelled wrong, is it counted wrong? ____

*e. Does a totally new screen appear when text gets to bottom of page? ____

*f. Is speed of text appearance appropriate? ____

g. Is speed of text erasure appropriate? ____

h. Are graphics used? ____
For what purpose?

i. Is animation used? ____
For what purpose?

j. Is color used? ____
For what purpose?

k. Is sound used? ____
Non-voice audio? ____ Voice audio? ____
For what purpose?
Can sound be turned off? ____

*l. Is inverse printing used? ____
For what purpose?

*m. Are letter forms regularly shaped? ____
Note any exceptions:

*n. When lines of continuous text appear on the screen, do lines break between words? ____

*o. When the user types in lines of continuous text, do new lines begin without using Return? ____

p. Does the program proceed at a rate conducive to maintaining concentration? ____
Is it slow enough to allow thinking and response? ____

q. Is the progress of the program under the control of the user (does not proceed until told to)? ____

*r. Is the task a power task? ____ A timed task? ____

s. What does the program do when an unexpected response is entered?

Ignore it? ____ Count it wrong and proceed? ____
Crash? ____ Give a hint as to what to do? ____

t. Can a student exit and begin program where he/she left off the next time he/she logs on? ____

u. Is a printer required to use the program? ____
Optional? ____

7. **Screen format:**

a. Is regular type used? ____ Graphics type? ____

*b. Is size of print readable? ____

*Is the image clear? ____

*Is it well spaced? ____

*c. Is the text written in mixed print rather than all-capitals? ____

d. Is the content presented in paragraphs? ____

Is it presented in short terse statements? ____

Is it presented in lists? ____

e. Does explanatory text needed to complete tasks remain on screen for reference during program? ____

f. Are lines skipped between lines of print? ____

g. Are text and response alternated frequently? ____

Are reading and doing in good balance, with frequent student involvement? ____

h. Is there a standard cue to tell how to proceed to the next screen? ____

i. Is there a majority of background, enabling easy focus on the print? ____

8. **Directions:**

a. Are instructions given as part of the program? ____
In accompanying printed materials? ____
Orally by instructor? ____

b. Are directions placed before the task to be done? ____

c. Do directions remain on the screen as tasks change? ____

d. Can directions be bypassed if student has previously used program and knows what to do? ____

*e. Can they be reaccessed during the program without starting the program over? ____

*f. Can student get back to point of exit after he/she has returned to the directions without working through the whole program again? ____

g. Are directions worded for program user's group (age, class, etc.)? ____

h. Are they complete? ____

9. **Content:**

*a. Is readability level relevant to level of concepts presented? ____

*b. Is the skill accurate in content and method? ____

*c. Can program be integrated with on-going curriculum? ____

d. Is it presented clearly? ____

*e. Can difficulty level be changed by instructor? ____
By student? ____

*f. Can speed be changed by instructor? ____
By student? ____

*g. Does program require purchase of accompanying printed materials? ____

*h. Is the correct answer given after a reasonable time or certain number of responses (usually 2)? ____

*i. Is the program accurately written in terms of
spelling? ____
Grammar? ____
Punctuation? ____

j. Does it provide hints if students need help? ____

*k. Is there branching for reteaching/tutoring based on wrong responses? ____

*l. Is content limited to convergent short answer responses? ____

m. Is competition used?
With self? ____
With a partner? ____
With the computer? ____

*n. Is the content free of undesirable value messages; and racial, ethnic, sexual and religious bias? ____

*o. Is the data bank large enough so students do not get the same problems/tasks if program is used more than once? ____

*p. Can a teacher with minimal programming knowledge alter the program to use content (math facts, spelling words, reading vocabulary, etc.) of his/her own class instead of what is preprogrammed? ____

*q. Does the program present content as well as or better than the instructional materials and techniques already being used? ____

10. **Reinforcement:**

*a. Are types of reinforcement varied? ____

*b. Is it more fun (rewarding) to get a right response? ____

*c. Does feedback guide student to correct response? ____

11. **Record keeping:**

a. Is there a scoring system? ____
Running score? ____
End score? ____

b. Is score given in terms children understand? ____

c. Is score the number right/wrong? ____
Percentage right/wrong? ____

d. Can the teacher enter the program later and know how the student did? ____
Score only? ____
Breakdown of items missed? ____

e. Are records for each student maintained from time to time? ____

f. If the child uses the program over several separate periods, are scores cumulative? ____

g. Is a printout of student performance available? ____

12. **Additional comments about the program:**

13. **Overall opinion of the program:**

14. **Suggested integration of this program with the regular curriculum:**

Field testing (1g.) In some cases, programs are being developed and marketed without actual prior use by students. Invariably, these programs contain inadequate instructional strategies as well as operational bugs. If a program has been tested, documentation should indicate how and on what population the program was tested and what revisions were made.

Typing ability (6a., b.) In selecting programs, it is better to select ones for young children in which they must type only one letter or number for yes/no or multiple-choice questions. Intermediate-grade children seem to have little trouble typing words by hunting for letters. Word processing programs, of course, involve a heavier load of typing and may cause difficulty for some children. Recently more emphasis is being given in elementary schools to teaching children proper keyboarding skills in order to facilitate their correct use of computers.

Correct spelling required (6d.) This is a difficult value judgment. Is correct spelling always necessary? Maybe it is for programs intended to teach spelling or names of states, months, and so on. But for open-ended items, should the computer accept the student's responses even if they are not spelled correctly? Teachers must decide the importance of correct spelling in all situations. For word processing programs, spelling need not be correct at first, for editing is easily done. Some word processors have spelling checkers which will indicate words spelled incorrectly and assist students in correcting the errors.

Screen appearance (6e.) In some programs, when the print reaches the bottom of the screen, the whole screen just moves up one line at a time, losing the top line and allowing additions of single lines at the very bottom of the screen. This is known as scrolling, and it requires the student to read continually at the bottom of the screen, which is not a normal reading behavior. During the reading of a book, when one reaches the bottom of a

page, he/she goes to the top of the next page and reads from top to bottom again. Good computer programs should erase a full screen, or at least part of it, and show an entirely new screen, just like a new page in a book.

Print appearance (6f.) Print should appear rapidly, so it seems that the whole screen shows at once. In some programs letters appear very slowly, apparently with the intent that students can read the print as it appears. However, observation indicates that students are more often fascinated with the movement of the letters and simply watch them appear. They then must go back and read the material, which only wastes instructional time. Besides, a good reader does not read letter by letter, but by recognizing whole words or parts of words. Graphics letters, which are drawn rather than typed, compound his/her problem, since they often appear and erase even more slowly than regular print.

It has been suggested that words should flash onto the screen by thought phrases, thus helping children read by phrases. Again, it must be noted that students read at differing rates; not all would keep up with the phrases as they appear. Thus this value would be lost.

Inverse printing (6l.) If the printing of a program is white on a gray or green screen, as is most common, inverse printing shows a block of white with black or green printing. Inverse printing is sometimes used to call attention to certain words or directions.

Unusual letter forms (6m.) This may be a problem on either computer screens or printers. Letters should be formed the way a child has been taught to read and write them. In some cases tail letters do not extend below the line, but have the whole letter above the base line. Other letter forms may be squeezed together, hardly showing a part of the letter. Letters may be too small to be distinguishable. Even without these special irregularities,

computer type is usually different from that used in books, and will require some adjustment by children.

Line breaks (6n., o.) When continuous lines of text appear on a screen, words should not be broken at random at ends of lines. This makes word recognition very difficult for children. If a word does not fit at the end of a line, the whole word should move to the next line automatically or be hyphenated correctly, as in books. If word breaks do occur, they should follow accepted syllabication rules. Word processing programs should have the wrap-around characteristic, allowing new lines to start automatically as needed without the typist having to watch the text and press Return.

Power versus timed task (6r.) A power task gives students as much time as is needed and moves forward only when students are ready to go on, whereas a timed task forces students to keep up with the pacing built into the program. Each is appropriate in certain circumstances.

Letter size (7b.) The distance students sit from the screen influences the legibility of different sized letters. The size of the display screen is also a factor. If letters are too large, the reader may feel a need to push back from the screen, whereas very small letters are hard to distinguish and require closer examination. Print should be clear and of an appropriate size according to the distance and size of the screen.

Image clear (7b.) This is a problem more apt to be related to the video display used than to the program. A color television that has been adapted for computer display is probably the least readable. Letters tend to spread, become fuzzy, and pulsate. Color should be turned off when using a program that does not require it. Certain brands of black and white television screens also tend to produce a fuzzy image. The sharpest image is produced by a monitor that connects directly into the computer. Green or gold screen

monitors may be easier on the eyes, although color monitors are needed for full use of some programs.

Spacing (7b.) The empty space on the screen around the print is very important for legibility. Solid lines written completely across the screen without double spacing between them are difficult for students to track with their eyes. This is especially true if print is in all capitals. Directions, the task, and the response prompt should each be distinct sections separated by plenty of empty space.

Regular mixed print versus all capital print (7c.) Earlier programs were written in all capitals because computers were capable of using only those letters. Eventually adaptations were made to produce both upper and lower case letters; yet too many programs are still written only in capitals. One reason for this may be that fewer typing movements are required to produce all capitals, since the shift key never has to be pushed. Also, capital letters cover more space and therefore can be seen better than small letters if the screen image is not clear.

Words written in all capitals lose their distinctive configuration or shape. Letters are all the same height and in straight horizontal alignment. This forces the reader to attend to separate letters until enough of the word is recognized to read it. The printing surface of all capital text is about 35 percent greater than that required for the same material in lowercase. This increases the number of fixation pauses required to perceive the material and thus decreases the number of words to be perceived per fixation. Lowercase letters have more variation in shape, or configuration, than uppercase letters. Distinctive characteristics of lowercase letters, the ascending and descending strokes, give more clues to which a reader responds. The use of configuration clues allows more rapid and accurate recognition of words.

Since children are taught to read using books that are written in regular mixed print, the transfer of the skill to reading computer programs will be much smoother if programs are also written in mixed print. Children should not have to read two radically different types of printing (Henney, 1983).

Getting help while working program (8e., f.) Basic directions should remain on the screen, if possible. If not, students should be told how to access a "help" page at any time during the program, and then return to that same point where they left the program without having to start over and work through all the material again.

Readability level (9a.) Directions should be written at a level easily read by students using the program. In fact, the required reading should be at an easier level than the concept so students can concentrate on the skill to be developed and not have to struggle with the basic reading of the program.

Accuracy of content (9b.) Frequently courseware is written by computer programmers who may not understand all the fine points of a concept or how it should be taught to children. Before using a program, teachers should check it carefully to insure that what is being taught or practiced agrees with what was taught through the school's curriculum.

Integration (9c.) Only programs that meet students' needs should be used. Although there are many programs available, it is a waste of finances and instructional time if programs are purchased randomly "just because they are there," or "because they are the cheapest." Each purchase should fulfill an identified curricular need. Preparatory instruction should be given before students are asked to use the program, and application made of the learning in other situations following computer use. The computer must be viewed as one

tool of learning, a part of a total lesson, not something to be done in isolation from other learning.

Difficulty level changeable (9e.) A good program has a large enough data bank that it is appropriate for children of varying abilities. The instructor or the students themselves should be able to set the level desired. As performance improves, higher levels can be given to students.

Speed changeable (9f.) Not all students read at the same speed or are able to complete tasks at the same speed. It is important to be able to adjust the speed at which a program progresses in order to let students read each screen thoroughly. If material progresses at too fast a rate, it is possible that students know how to do the skill but are not able to read directions and do the task at a fast enough rate. Therefore an error would be recorded due to speed problems only.

Accompanying printed materials (9g.) Many computer programs are now one unit in a package of instructional materials involving workbook pages, books, projects, written tests, and so on to be used as a supplement to the computer lesson. Basal reader companies may have computer programs that fit into ongoing lessons in the basal. Although this package approach may increase the cost of purchasing the programs, it has the advantage of making the computer program a meaningful part of other instructional activities rather than just something extra to do. It also saves the teacher time in developing related supplementary activities.

Repeated tries (9h.) With informing or reinforcing programs, if students give a wrong response, they should have another chance before the right answer is exposed. Most programs allow two or three tries before continuing. If only one try is given, students are under too much pressure and then feel defeated if they miss. An ideal situation is one in which appropriate clues are given, such as "Check your spelling," "No letter may be used twice," or

"You have already used that," rather than giving a general message such as "Try again." On the other hand, unlimited tries may be equally frustrating. If students try two or three times and are still in error, they probably do not know the answer. If the program makes them keep trying endlessly and will not continue until the right response is given, students often give up and turn off the computer.

Grammatical accuracy (9i.) Proofread programs carefully to insure that words are spelled accurately and grammar and punctuation are used correctly. All material to be used by children should model proper usage.

Branching (9k.) For reinforcing or informing programs, if students show a pattern of misunderstanding through repeated errors, a good program will branch to give those students lower-level work or additional work on the area of weakness. Instructions about how to do the task may also be presented if the program is an informing one. On the other hand, if a student is doing exceptionally well for a series of tasks, the program will recognize this and skip to more difficult work. A program without branching, called linear programming, takes every student through the same set of tasks regardless of performance.

Convergent versus divergent thinking (9l.) With most reinforcing programs, the student is expected to give a definite predictable answer. Convergent thinking can be easily judged right or wrong. Programs that challenge more open-ended thinking are rarer, for microcomputers may not be capable of judging such variable responses. Open-ended tasks are more valuable, however, if students are to be prepared to deal with the problems and alternatives met in life.

Values and biases (9n.) Although children may not be aware of the subtle messages they are receiving, some adults are concerned with the values and biases portrayed by some computer programs, such as those that involve

battles, hangings, and women as the helpless people who must be rescued. On the other hand, depending on the time the program was written or the time and setting of the program content, such values or biases might be acceptable. Teachers should be alert to such messages and decide if such programs should be used by children.

Data bank (9o.) A program should have enough spelling words, math problems, sentences, stories, or whatever content is involved so that students do not get the same tasks each time they work through the program.

Entering own content (9p.) Although most teachers do not have time to learn programming languages, some programs are built with an editing section that allows teachers to add spelling words, sentences, math facts, reading vocabulary, and so forth on which their students need work. This is a big asset because it allows the program to be a meaningful part of the ongoing curriculum.

Computer better than traditional methods (9q.) A computer has the capacity to do many things. This is good if teachers use the computer for purposes that cannot be accomplished by other less expensive means. Many of the programs on the market today do little that teachers have not done before through traditional methods and media. However, over a three to five year period, computers may be less expensive than consumable workbooks. Serious consideration needs to be given to this question before purchasing a program.

The argument is frequently offered by teachers that even though many of the reinforcing programs are simply electronic workbook pages, the children enjoy doing the work much more on the computer than in a workbook, so it is worth the money and time. This may be true at present, because computer use is relatively new to students, but the children who are now preschoolers are being exposed to computer use much earlier. Since computers will always be a part of their lives, starting when these children enter school, they may view

computers as just one more tool to be used for learning; the novelty will no longer be a motivational factor. It is doubtful that the excitement of getting to use the computer will continue to hold children's attention as it does today. Therefore, teachers should develop more logical reasons for having children work at the computer.

Reinforcement (10a., b., c.) A variety of reinforcements is preferred. Students enjoy the graphics pictures the programs use, at least for the first few times they see them. Reinforcement that is unrelated to the task but just something extra is not appropriate. Personalized verbal statements are more encouraging to the student, but even these are difficult to vary enough so that they do not become mechanical. In some programs it is more fun to get a wrong answer than a right one. Reinforcement for correct responses should be more rewarding than that for errors.

Feedback should provide information that will help students proceed in the program rather than simply indicating the correctness of the response. Hints about what to do are helpful but need not specify the correct answer. When using experiencing programs, it is more beneficial if inaccuracies and gaps in knowledge are not immediately corrected or supplied, for then students have questions that they ponder and bring to the learning situation, and are more likely to be actively involved and to listen in class.

Although there are many points to evaluate on this checklist, not all of them need to be used for every program. After using the checklist several times, it will be easier to see how everything fits together. Eventually teachers who use this checklist repeatedly while viewing programs will be able to know what to look for without direct reference to the checklist.

Software evaluation should be done by teachers who will be using the programs. Unless the program meets students' learning needs and can be integrated with other work the students do, its purchase is not advised.

Writing and Reading

Communication involves four language arts: speakers and writers encode messages to be decoded by those who receive them, the listeners and readers. Traditionally, children have been taught to read (decode and interpret thoughts of others) before they learn to write (compose and record their own thoughts). Computers have the capability to modify this approach, for they make writing much easier. Word processing programs allow students to type in text, correct spelling, move sentences or paragraphs, change wording, or erase text. Using a word processor encourages writers to edit their writing through several drafts and to polish it to the highest level.

There has long been a controversy about the teaching of composition in schools. One viewpoint proposes that children should be allowed to write creatively, be encouraged to get their ideas down on paper without being concerned about using correct spelling, grammar, etc. because to concentrate on these would curtail creative thinking. Others emphasize the importance of consistent use of correct spelling, grammar, and handwriting in all work children do rather than just in assigned lessons or tests. There is a middle ground. Some educators attempt to encompass both extremes by allowing children to write freely at the time they are creating, but then requiring the completion of several drafts until a finished product results, especially if the writing is to be shared with others. In theory, this would appear to be a preferable approach, but children quickly tire of the task of rewriting, and knowing this stage is ahead often limits their original efforts. Also, some teachers tire of regrading the same composition and do not require anything beyond the first writing.

With a word processor, children are free to play with ideas, to try out different wordings and arrangements without worrying about extensive rewriting. Because correcting errors is so easy, they can let ideas come as

they think about them, and can truly focus on the content they want to write about. The form can be developed later.

Using a word processor makes the polishing task easier. The entire composition will need to be written only once. Proofreading can be done on the computer screen before printing. Corrections can be located on a first printout and made quickly through the use of a few simple commands. A final easily read paper can be printed, making the teacher's task also easier if he/she must read and evaluate many papers.

A long-recognized method for teaching reading to children is the language experience approach. Basically, it consists of using the children's own creative thoughts as the written source for teaching reading skills. Students are presented with a stimulus situation and are encouraged to express themselves orally while an adult records the students' words in writing. The copy is then used later for reading instruction. Motivation is high because children are reading something meaningful to them. Word processors are now providing the possibility of updating this approach by using modern technology. Teachers can record children's oral contributions on the computer while children watch. Changes and corrections can be made easily. Individual copies for children can be printed quickly.

As students develop minimum composition skills, they can use the computer to write their own thoughts without an adult present. Granted, there may be misspelled words, incomplete sentences, gaps in sequence, irrelevant information, etc. but students are able to see their thoughts become writing. The role of the adult then enters in as help is given to polish the writing. Exacting and critical reading by students is necessary to determine errors and to make decisions about the best way to word something. As children write their compositions and rework them, they are practicing reading in a personally meaningful way. The intrinsic motivation of reading one's own

writing is very strong. Authoring becomes synonymous with reading. Children recognize the structure of good writing through attempting to produce it themselves.

Bank Street Writer

There are many word processing programs on the market today, but some include many factors which are rarely, if ever, needed in an elementary classroom. These programs tend to be more complicated to use, take longer to learn, have more involved manuals, and can offer fewer comprehensive on-screen prompts since there are so many possible commands. What is needed are software tools designed specifically for students, to help them do those tasks required in schools.

The **Bank Street Writer** was developed jointly by researchers at the Center for Children and Technology at the Bank Street College and by Intentional Education. The program is now available from Scholastic, Inc., and from Broderbund Publishers. The decision to develop a new word processor was made as researchers studied children's revision strategies and reviewed several available word processors. The **Bank Street Writer** was developed to include those functions which students would reasonably need. Commands are displayed on the screen at all times, greatly reducing the memory load for students, as well as aiding them in knowing at all times where they are in the program. The program is designed to be used by fourth grade or older students.

The original version of the **Bank Street Writer** involves the interactive use of three modes. Text is typed in the WRITE mode. The EDIT mode enables movement of the cursor for the purposes of changing text, erasing or moving blocks of text, finding given words, and replacing words. The TRANSFER mode involves the record keeping, saving, and printing of files. An expanded

version allows some types of editing to be done as text is typed without changing modes.

The Scholastic **Bank Street Writer** package comes with a notebook for the teacher, providing operating information, a student guide section, and exercises to be typed onto a disk for students to use in gaining practice using the various commands. There are three master disks included.

On the reverse side of the master disk is a tutorial program that gives exercises in using commands and operations for the WRITE and EDIT modes, although no help is given with the TRANSFER mode. The tutorial program is structured so that students can easily succeed without understanding how to use the program, for every direction is given and no decision making is required. The written student guide is more helpful in explaining commands and processes and answering questions. After studying this printed information, students should be ready to begin writing, referring to the guide as problems arise.

The program is not difficult to use. All commands remain at the top of the screen and are selected by highlighting the one desired. Questions then guide the user, step by step, through the selected process. The safeguards built into the program make it almost impossible to do something one did not intend to do.

Because the **Bank Street Writer** was written for use by students, it has certain limitations. The text cannot be right-justified (lines are not all even at the righthand margin). With the original version, underlining is not possible. Formatting must be done each time a copy is printed, and cannot be written and saved into the file. Mathematical tables are not possible. Although these qualities are ones not usually needed in earlier composition,

at times they would be appreciated by more sophisticated writers. Other word processors have such features. There is ample opportunity to select one to meet your needs.

The typing required for word processing is a skill that elementary children do not usually have. Most children manage to successfully use a hunt-and-peck system, soon learning where to find frequently used letters on the keyboard. Secondary business instructors, however, are concerned that bad habits of fingering and hand position are being learned which will be difficult to break when actual typing classes are taken. If educators are concerned about this, there appear to be two possible solutions: (1) Do not let elementary children use a keyboard. (2) Formally teach correct typing (keyboarding) to elementary children before they begin using the computer. In view of today's emphasis on computers, the former does not seem feasible. For the latter, there are several computer programs that teach typing. In selecting a typing program, teachers should be aware that some are reinforcing programs for developing speed once fingering is learned, rather than instructional programs. Programs should be selected to meet the determined purpose. It would also be wise to select one similar in approach to that used for later typing courses in the school system. In addition to basic fingering skills, children need to be shown that there are spaces after punctuation, how to make capital letters, and how to use the special-function keys on the computer keyboard.

Although most children enjoy typing and watching words appear on the screen, some teachers feel that this objective is not the most valuable benefit of using a word processing program for children. In order for children to have the opportunity to think creatively, but to eliminate the mechanics of typing their thoughts and to save time for more valuable instruction, teachers (or parent volunteers, aides, or more advanced students)

can take dictation from children and type the composition onto the computer for them. Printouts of the compositions can be used for individual tutoring on the more advanced writing skills. Children then use the word processor to make their editorial changes.

Scholastic's **Bank Street Writer** notebook provides a number of different exercises for students to do which provide practice in using the various commands and processes. Teachers who are familiar with the capacities of the **Writer** can design numerous tasks that will use the program, while giving practice in reading and language skills. Students can do each exercise and save it under their own code name. Copies can be printed for the teacher to check. A few suggestions follow:

1. Sentences with misspelled spelling words can be edited and corrected by students.

2. Sentences with incorrect grammar can be corrected by students.

3. Incorrectly spelled homonyms in sentences can be deleted and spelled correctly.

4. Run-on sentences or sentences with complex patterns can be typed as kernel sentences.

5. Paragraphs of a story can be presented in scrambled order. Students use the Move command to move paragraphs into the proper sequence. An awareness of story grammar would be helpful. This same exercise could also give sentences scrambled within a paragraph for students to arrange in a logical order.

6. A kernel sentence can be presented. Students retype it, adding a word or phrase telling "where," then retype the whole sentence again, adding a word or phrase telling "why," continuing in this way until the 5 Ws and H

(who, what, when, why, where, how) have been included, resulting in a very long sentence. The rewriting required for such an exercise would be much more tedious without the computer.

7. Paragraphs with an irrelevant sentence can be presented. Students identify the sentence and use Erase to get rid of it.

8. A long selection can be presented without paragraph divisions. Students read the text, deciding where paragraphs should be and divide the text accordingly.

9. Paragraphs with no punctuation or capitals can be displayed; students will add both where needed.

10. A paragraph with many common abbreviations can be written. Students will write the spelled-out words in place of the abbreviations.

11. Paragraphs with contractions can be rewritten, giving the two separate words in each case.

12. A list of words can be alphabetized, using the Move command.

13. Students can write selections, and then exchange with a friend. Each can edit the other's work.

14. Creative writing done by students can be edited for run-on or incomplete sentences, incorrect spelling and grammar, confusing wordings, or unclear paragraphs. Using rough draft printouts, teachers can help students find such errors and mark them. Tutoring can be done as needed. Then students make corrections on the computer and print final copies.

15. Reports from social studies, science or any subject area can be written by students with emphasis on the ideas, not being concerned with mechanics at first. As many rough drafts as necessary can be printed, with corrections made, until a final polished copy is obtained.

16. If several computers are available, a student at each one can be given a story starter sentence or two. He/she then writes for a period of two

to five minutes. At that point, all students change machines, reread what has been written, and continue the same story by writing for another short period of time. This continues as long as desired. Finally, the cumulative stories can be reread to the whole class. If only one computer is available, this same idea could be implemented with one child at a time adding to a story throughout the day.

17. After children have read a story, they could answer questions which the teacher had previously written on the word processor.

18. After only part of a story is read, students can write their own endings.

19. After studying the writing style of a selected author, students could attempt to write a story using the characteristics of that author's style.

20. The main ideas and supporting details of a selection can be outlined.

21. After reading a paragraph, students can paraphrase it, keeping the same ideas but using different words.

22. Students can write sentences using the new vocabulary from a story, or use the new words to complete blanks in sentences which the teacher has previously written.

23. Notes can be taken when study and research reading is done. A summary report can then be written.

24. Two columns can be presented on the screen. Column 1 has the first halves of sentences and Column 2 has the second halves of sentences. Children can use the MOVE command to put the two halves together. This format could also be used to work on cause and effect sentences, subject/verb agreement, or sequence of events; or to match vocabulary and definitions, synonyms, antonyms, homonyms, abbreviations, characters and attributes, etc.

To provide activities to practice with various writing objectives and procedures, using the **Bank Street Writer** features and functions, Scholastic publishes a computer program with two levels of Activity Files. The **Writing Skills Bank** is for grades four through six, and the **Writing Activities and Language Skill Builders** is for grades six through eight.

In order to help students learn the use of the various commands and processes without direct hands-on use of the computer, Scholastic publishes a workbook that includes exercises to practice writing skills and use of the **Bank Street Writer** features. This is a useful addition to the program as long as teachers do not use it as just another workbook, and will give actual practice at the computer to apply what is learned through the workbook. The workbook is helpful to further learning when not enough computers are available for use by all children at one time, but it will be of no value if the opportunity to actually apply the learning using the word processor is not forthcoming.

Although the **Bank Street Writer** is at present the most widely used word processor in elementary schools, there are a number of other programs available. The names of some of these may be found in the Activity Section at the end of this chapter. In order to determine which is best for your particular students, it is a good idea to become familiar with several of these.

Critics of the **Bank Street Writer** believe that the program is too simplified with not enough capabilities for most writers. Even if children are trained to use the program in the beginning, it is not long before they outgrow it and need a more sophisticated program. Critics believe that elementary students can learn to use more elaborate programs with proper training, and therefore will not have to change later on.

Bank Street Speller

Scholastic also publishes the **Bank Street Speller**, which is to be used in conjunction with files written on the **Bank Street Writer**. Using two disk drives is preferred, although one will work with frequent changing of disks. The **Speller** does not work independently of the **Writer**. The program prints out (or shows on the screen) all words used in a file in alphabetical order, shows the number of times each is used, and the total number of different words used. Then it checks this list against its dictionary, printing the ones not in the dictionary. Words may be recorded as not in the dictionary due to being incorrectly spelled, being proper names, or simply because they are words not in the dictionary on the disk. Frequently used words may be added to the dictionary if two disks drives are available. Text is then presented a few lines at a time, with the unfound word highlighted. Students can ignore it (leave it as it is) and move to the next word, change it, or ask for suggested spellings. In this latter case, the program will display any words in its dictionary that are similar to the misspelled one, but students must be able to recognize which word was wanted and then make the change. The program then saves all changes.

Teachers and parents may be concerned that if children use the **Speller** to check their work, they may not learn to spell. The **Speller** does not spell the words for students, however. It only flags words that need to be checked for possible misspellings. This is analogous to the red circles teachers have placed on students' written pages for years. Students then need to look up the word in a regular dictionary, or ask the computer program to suggest spellings, in which case they still must select the correct spelling and make the needed correction.

Story Tree

Another program available from Scholastic is Story Tree, a program that

provides the structure for writing interactive stories. Small parts of a story are presented, followed by choices the reader may make to continue the story in several directions. The sequential development of the story is dependent upon selections made throughout by the reader. One can read the same title many times and get a different story each time because of different routes selected.

The package from Scholastic comes in a notebook providing operational procedures, a student tutorial section, and alternative uses of the program besides writing stories. Two master disks and two story disks are included. The story disk provides three applications of the program: a fictional story, an informational selection, and a library book browsing program. The program is easy to use, and learning to write one's own stories is not difficult with the step-by-step instruction provided. There is an editing component that can be used while writing or later to make changes.

Stories themselves have much potential for use as reading selections to be enjoyed by children. Children of all ages could use the already-prepared stories, and others added by the teacher. But the greatest benefit of the program is to stimulate creative writing by students. Using this program for reading and writing enables children to use a variety of skills, such as predicting outcomes, cause and effect, considering various alternatives, developing multiple plots, sequence, and sentence and paragraph formation.

Designing the steps and varying routes of a story is a challenging task, and would probably require teacher guidance and modeling, at least on the first attempt. It would be a good group project, with all students suggesting story parts and choices, and the teacher doing the actual work of entering the story into the computer program, explaining steps along with way. It goes without saying that teachers should practice writing stories themselves first to be sure they know how to use the procedures.

Children in the primary grades would enjoy reading the stories, but probably only the very able students could design a story on their own. Fourth graders and above should enjoy planning and writing stories, either to share with classmates or to share with children in the younger grades.

Each part of the story must be written separately, with the possible connections to following pages. A flowchart is an absolute essential to keep track of which pages go to which, and which routes are yet uncompleted. It is recommended that all parts should be roughed out before starting to type the story into the computer, although it is possible to let the story develop as the typing is done. Even in this case, a flowchart should be completed as the story grows in order to keep track of branches. The flowchart shows the connections and the various branches of the story as they are developed.

To plan an interactive story, one must select a main character with the possibilities of a variety of plots. The story could be an adventure or just a descriptive story. Branches to different parts of the story should be logical, in that the events in which the character is involved could naturally happen based on previous events in the story. Some parts of the story can intertwine; that is, there may be several paths which eventually lead to a certain point in the story, followed by more choices leading into other branches. Branches may all lead to one common ending, but often several different endings will be more appropriate. As the writer is planning a story, the sequence of all these threads must be kept in mind so the whole story makes sense.

There are three types of branches possible in this program: (1) a "continue" branch, when the following frame simply continues the story line; (2) a "choice" branch, in which the writer can designate from two to four directions for the story to go; and (3) a "chance" branch, in which two choices can be given, for which the writer determines what percentage of the

time the reader will receive each branch. For this latter type, the reader will not see any choices on the screen; the frame will appear as a "continue" frame, but the computer automatically takes him/her to one or the other of the "chance" branches.

When writing the choices, they should be as part of the sentence of the story, which will flow out of the paragraph being read and right into the next page. This tends to disrupt the reader's thoughts less than if only key words or a main idea from the following page is used as a choice.

The Print feature of the story prints two pages (screens) to one page of paper. These could be cut apart to make separate pages. There is room at the side of the printed matter for children to draw pictures related to the story. The pages could then be fastened together, with a cover added, to make a scrambled book. Instead of reading straight through the book in the usual manner, the reader goes to whatever pages are designated for the choices he/she selects.

Following the use of the Story Tree program, students might enjoy reading Scholastic's **Twistaplot** series, books that are written in an interactive plot form. Bantam Publications produces the **Choose Your Own Adventure** series, which is of this same format.

The **Bank Street Writer** and the **Story Tree** are two of many programs that can be used to encourage creative writing. Using a computer for writing results in reading--reading one's own writing as well as writing done by others. Although this reading is limited and does not provide all the reading students should do, it is a personally meaningful use of reading. Using the printouts of what has been written, teachers can identify and teach needed reading skills. Decoding and comprehension can just as well be taught from students' writing as from basal reader selections. Attempting to write,

struggling with all the processes involved, rewriting several drafts, and feeling pride in a final polished copy are guaranteed to make students more appreciative of literature and other types of writing done by "real authors" whose works they are expected to read.

Use of computers as tools will change the teaching that is done. As smaller word processors become available in the near future, each student can have access to one. These smaller units could be networked with a larger computer which would enable checking of spelling, sentence structure, grammar, use of trite expressions, etc. With the mechanics of writing easily handled by computers, instructional time could be used to work on the structure of communication. How does writing differ from speech? What is a complete sentence? In what different forms do sentences come? What makes a good paragraph? Do ideas relate appropriately? Are paragraphs sequenced logically? How can wording be tightened to eliminate wordiness and repetition of basic ideas? What are various alternatives for developing a theme? Which one is best? What different styles of writing are there? What makes each one distinctive? These are all aspects of writing that are not given much attention in elementary schools because so much time is required to teach handwriting, spelling, and grammar. Teachers are often satisfied if students simply hand in a paper that is mostly correct in spelling and grammar and makes some sense. The teacher is rare who works with elementary children on the finer aspects of good writing.

While the way children are learning is changing, teachers need to grow too. Computers should be viewed as a means for stretching their ability to think. Teachers' writing skills are often not as refined as they should be. The **Bank Street Writer** and other similar programs provide the opportunity for both teachers and students to think in new ways and develop new abilities.

It can be readily seen that if all students are to use the **Bank Street** Writer and other word processors for the many jobs for which it is appropriate, and if they have the computer time necessary to develop interactive stories, each classroom must have several computers available all the time. Writing programs will not be effectively used when computers are available only occasionally and on a predetermined schedule. How much writing would any child do if he/she had to sign up for **THE** pencil in the school a week before it was needed? Until schools have many more computers for children to use frequently whenever needed, one wonders if word processing and writing programs will make a big impact in schools. The potential of such programs is there, but without better facilities, it may not be realized.

Children's Books Related to Computers

The field of children's literature often reflects the culture and events of the time. The extensive impact of computers in our culture is evident through the many books written for children in the elementary grades which have computers central to their content.

Teachers know that children will more readily read things in which they are interested. Computers are definitely an area of high interest for children at present. If such books were available, children would undoubtedly be eager to read them. While computers are used in schools to help children to read (as well as for other purposes), children can also learn about computers through reading. This provides an excellent opportunity to give children practice in reading, using meaningful materials.

Because the field of computers and high technology is expanding so rapidly, a book's copyright date is significant. In those cases where information is somewhat outdated, the book can still be used if the teacher helps students to identify which parts are still accurate and which information has now been updated or changed, thus learning about the historical development of computers. This provides students with an opportunity to apply critical comprehension skills. A source should not be discarded completely until its content has been examined to select that which is still usable.

Children's books about computers fall into three main categories: computer literacy, programming, and fiction. Selected books in each category are reviewed below, although many more are available. A more complete bibliography may be obtained from the author. Teachers should continue to watch for other books as they are published, and make use of them in the

classroom. It is important to recognize that not all books are good. Teachers need to read them before using them with children to decide if they agree with the content as presented.

Computer Literacy

These sources could be read by individual students who want to learn about computers, or could be used by teachers to plan lessons for an entire class. It would also be a good idea to have several of these books in a reference section of a classroom library to answer questions that may arise.

For the purpose of this listing, "computer literacy" is defined to include historical development of computers and robots, how computers work, terminology, the binary system, general information about programming and languages, applications of computers in today's world, computer-related careers, and predictions of computer use in the future.

BILLARD, MARY. **All About Robots.** New York: Platt & Munk, 1982.
This is a well-written book including easily understood information and many colorful pictures. It includes the history of robots; robots as they are used in industry, research, space, films, and the home; and speculation about robots in the future. The readability level is approximately fourth grade.

BROWN, CHRISTOPHER (Ed.) **Mr. Byte Presents a Kid's Book About Computers.** Yellow Springs, OH: Antioch Publishing Co., 1983.
This is one of a series of Mr. Byte books. Others include **Computer Games, Computers in Space, Computers in Sports, Computer Art,** and **Computers and Robots.** These are easy to understand books, explaining the use of computers in various applications. Colorful and attractive pictures help to clarify the content. Each book has a different set of stickers, relevant to the

particular book. Each book also gives one program ready to type into the computer, which is relevant to the topic of the book. The readability level is approximately fourth grade.

D'IGNAZIO, FRED. **The Star Wars Question and Answer Book About Computers.** New York: Random House, 1983.

This factual book covers topics such as the inside of a computer, computer games, history of computers, modern computers, programming, use of computers in making movies, robots, uses of computers in daily life, and computers of the future. Material is presented in an interesting way in small segments, with frequent subheadings and many meaningful pictures. The only use of the **Star Wars** theme is as an attention getter in the title, plus a few pictures of R2-D2 and C-3PO scattered throughout the book. The information given is much broader than **Star Wars.** This is an excellent source, presented attractively. The readability level is approximately fifth grade.

SPENCER, DONALD D., **Famous People of Computing.** Ormond Beach, FL: Camelot Publishing Co., 1982.

The pages in this book are tear-out posters of people who have made significant contributions in the field of computers. There is a large portrait drawing on each page, with a brief paragraph at the bottom telling for what this person is known. The book is intended to provide historical information about computer development. It is suggested that students select a poster and research about that person thoroughly. The readability level is approximately fifth grade.

Programming

These books are best used by individual students at the time they have

an opportunity to work at a computer, to make immediate application of the content. They are not books to just read through, and would be difficult to follow unless ideas could be tried out on a computer.

CARLSON, EDWARD. **Kids and the Apple.** Reston, VA: Reston Publishing Co., 1982.

This is a text for teaching programming. Books are available for several different brands of computers (specify brand when ordering). Commands and processes are taught in a clear, understandable way. Exercises would be interesting to students. It is intended for use by students seventh grade or above, but would be a good reference for teachers working with elementary children.

LARSEN, SALLY G., **Computers for Kids.** Morristown, NJ: Creative Computing Press, 1981.

This is a clearly written book to teach programming in BASIC. Explanations are easy to understand. Sample programs demonstrate use of commands. "Notes for Parents and Teachers" provide additional information at the end of the text. The book is published for different computer brands, so specify brand desired when ordering. The readability level is approximately fourth grade.

VAN HORN, ROYAL, **Computer Programming for Kids and Other Beginners.** Austin, TX: Sterling Swift Publishing Co., 1982.

This is an excellent source for teaching programming in BASIC. Explanations are complete, going step by step, pointing out things to be especially careful about. Interesting sample programs exemplify commands. It goes into more advanced programming than some programming books for children do, yet the procedures are presented clearly. Additional information is given for parents

and teachers. The readability level is approximately third grade.

Fiction

This is a most intriguing area. Computers and high technology invite interpretation from a fictional standpoint. Fantasy and/or science fiction frequently are written to explain what we do not know as factual. Stories once written as science fiction may be now partially or totally reallife. Again, the copyright date is most significant. Such writing would invite critical thinking by students to determine which parts are true today, and which ones are still based on speculation. Some books may also serve as stimuli for creative writing, following discussions about what life may be like in the future.

BISHOP, ANN, **Hello, Mr. Chips! Computer Jokes & Riddles.** New York: E. P. Dutton, 1982.

The riddles and jokes in this book require some knowledge and experience with computers in order to understand the play on words and the situations implied. It is an interesting book, applying knowledge of computer terminology in a novel way. The riddles and jokes are written in all capitals. The readability level is about fourth grade, but understanding level may be higher.

BYARS, BETSY, **The Computer Nut.** New York: Viking, 1984.

While working on her dad's computer at the office, Kate receives a message. It is from an alien, but Kate at first thinks it is sent by computer from a boy she knows. The adventures the children get into while trying to figure out who is sending the messages make an exciting, and at times hilarious, story. The readability level is approximately sixth grade.

DANK, MILTON and GLORIA DANK, **The Computer Caper.** New York: Delacorte Press, 1983.

A gang of intermediate grade students put their talents together to bug a computer in an office. They want to find out a thief's password and examine his dealings using their school terminal, which happens to be hooked into the same mainframe computer, in order to help get the money back that the thief swindled from a friend's father. Everything turns out all right in the end, but the children have some real adventures in the process. Although the story is intriguing, and moves quickly to keep the reader's attention, one might question the advisability of having children read such a book and perhaps get the idea of stealing information from computers. The readability level is approximately fifth grade.

D'IGNAZIO, FRED, **Katie and the Computer.** Morristown, NJ: Creative Computing Press, 1979.

A girl falls through a television screen into a computer and sees all the "people" working inside the various parts of the computer to produce a flower for her, which will be displayed on the screen. Although the book is obviously fiction, the use of persons and common environmental surroundings could be misleading to a child trying to understand how a computer works. The flyleaves of the book present factual information about a computer, covering basically the same material included in the fictional account. It is hoped that this will teach the child the appropriate information. The readability level is approximately third grade.

KELLER, CHARLES, **Ohm on the Range: Robot and Computer Jokes.** Englewood Cliffs, NJ: Prentice-Hall, 1982.

The jokes in this book are about computers and robots. Some of them are of the same style as elephant or pickle jokes of the past. Children would really enjoy reading this book and sharing the jokes with their friends. Black and white pictures scattered throughout the book add a lot of interest. The format is attractive, with much open background to set off the jokes. Some experience with and knowledge about computers would be necessary to get the fun from this book. The readability level is approximately upper third or fourth grade.

LEVY, ELIZABETH, **The Computer That Said Steal Me.** New York: Four Winds Press, 1983.

Although the title of this book implies it would be about computers, in fact that is a minor part of its plot. The story involves a group of intermediate grade children and their activities, relationships, and concerns. Family background, money, stealing, and nuclear war are the major themes dealt with in the story. The chess computer is the object stolen, but is important to the plot only for that purpose. The story is an excellent, fast-moving one that holds the reader's attention throughout while teaching some important lessons. The readability level is approximately fifth grade.

MAC GREGOR, ELLEN and DORA PANTELL, **Miss Pickerell Meets Mr. H.U.M.** New York: McGraw Hill, 1974.

This story describes a culture about to be overtaken by computers. People are told what to do and they do it--all except Miss Pickerell and some family and close friends, who manage to find the source of the head computer and make some changes to save the people. It is a really interesting story, and especially impressive considering the date of publication. A great deal of insight is evident about what might happen if computers are not controlled by

caring people. The readability level is approximately fourth grade.

SLOTE, ALFRED, **C.O.L.A.R.** New York: Avon Books, 1981.

_____, **My Robot Buddy.** New York: J. B. Lippincott Co., 1975.

These two books by the same author are about Jack and his robot brother, Danny. Although the plots are sequential, either book can stand alone. The first book explains how Danny came to be and some adventures he and Jack had. The second one deals with a community of robots escaped from their families, and how Danny and Jack and their family help the robots. The books are set in the far future. Children will find the stories very intriguing. The readability level is about fourth grade.

WILKES, MARILYN, **C.L.U.T.Z.** New York: Bantam Books, 1982. This is a really exciting story about a family of the twenty-second century that advertises for a robot. The story tells of the many adventures and happenings that occur after a robot is added to the family. The vocabulary uses terminology of a future computer age: "cryobin" for refrigerator, "annums" for years. Experiences, housing, careers, transportation, and so on are all depicted as they may be in the future. The plot is fast-moving, holding the reader's attention throughout. The readability level is approximately fifth grade.

YOLEN, JANE, **The Robot and Rebecca and the Missing Owser.** New York: Alfred A. Knopf, 1981.

What is an owser? A dog, of course, but you will need to read a way into the book to figure this out. This story is set in 2121. The setting and events of the story are written about things that may be in that time period. A rich lady loses her owser, or rather it is apparently stolen. Rebecca and her robot help her find it. This mystery story is quite involved but simple

enough for third graders to enjoy.

Summary

Computers are here to stay. Children in today's world have known no other way of life. It is natural that they are interested in using them and learning about them.

Books about computers are an essential part of a classroom library. There should be books of all three types: computer literacy, programming, and fiction. Not every child will be interested in learning, nor needs to learn, to program, but for those who are curious about how programs work in the computer, such books should be available. There are ones even simple enough for elementary children to use.

As for learning the technical information about how a computer works, again this is not essential for everyone to know. We do not need to know what makes a telephone work in order to use one. For those children who are interested in such information, however, there are books written at a simple level which should be available for them to read. Also such books should be kept in the classroom for reference as questions arise.

All children should be exposed to areas such as the use of computers in many different ways in our lives today, career opportunities in computer-related fields, and speculation about computer use in the future. These are areas which will help children adjust to their world and learn to live in it effectively.

As for the fictional books, a wide variety should be available, allowing children to select those they want to read. There are so many good story books, and more are being published frequently. There is no doubt that if

teachers expose children to samples from this area, they will definitely want to read them. Such books may also serve as a stimulus for creative writing of the science fiction type by children.

If your goal as a teacher is to develop children who want to read, provide meaningful and interesting reading sources. Computers have opened up a broad area of resources that your children will be excited about. Take advantage of this interest.

REFERENCES

1. Tinker, Miles. **Legibility of Print.** Ames, IA: Iowa State University Press, 1964, p. 8.

2. Thomas, Rex A. and John P. Boysen. "A Taxonomy for the Instructional Use of Computers," **AEDS Monitor,** 22 (11, 12), May/June 1984, pp. 15-17, 26.

3. Henney, Maribeth. "The Effect of All-Capital vs. Regular Mixed Print, as Presented on a Computer Screen, on Reading Rate and Accuracy," **AEDS Monitor,** 16 (4), Summer 1983, pp. 205-217.